Name _____

Line Graphs

Essential Question How can you read a line graph?

A.7.3.1 Identify the change over time

DAP.16.3.1 Make predictions for a given set of data

A **line graph** uses a line to show how data change over time.

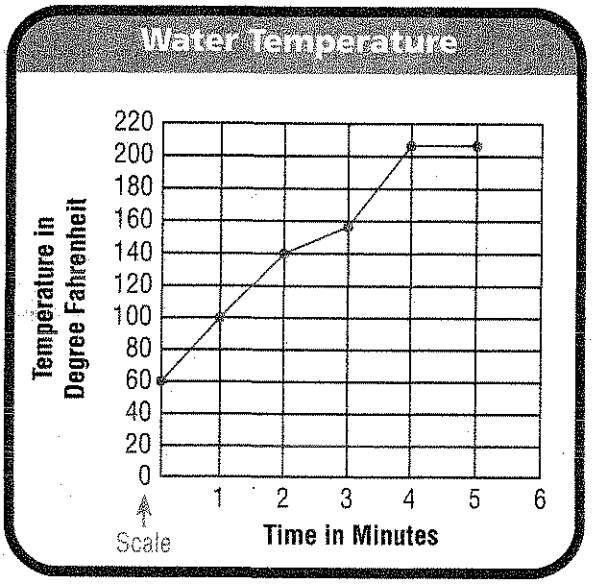
UNLOCK the Problem REAL WORLD

Isabella and her mother did an experiment to see how long it took water to boil. The line graph shows the data they collected. What was the water temperature at 2 minutes?

You can locate points on a line graph as you locate points on a grid.

Find the vertical line for 2 minutes. Move up to the point.

Follow the horizontal line left to the scale showing degrees.



Math Talk

Is it reasonable to say the temperature of the water at 4 minutes is greater than the temperature of the water at 1 minute? Explain.

The point for 2 minutes is at _____ degrees.

So, the temperature of the water at 2 minutes was _____ degrees.

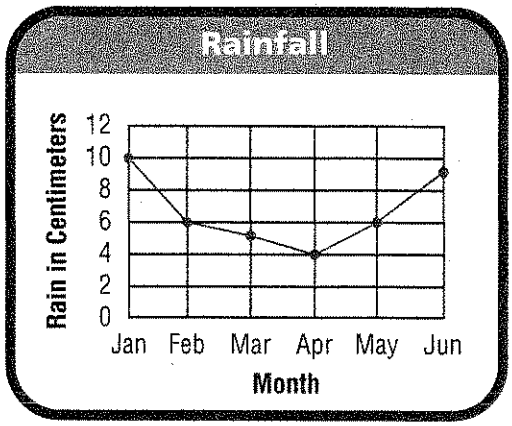
1. At what minute was the water temperature about 160 degrees? _____

2. Between which two minutes did the temperature rise the most? _____

3. **What if** Isabella removed the water from the stove at Minute 5 and the temperature dropped 20 degrees in one minute? What would the temperature be at 6 minutes? _____

Example Analyze data on a line graph.

The students in Mr. Han's class measured the amount of rainfall outside their school each month for 6 months. The line graph shows the data they collected. How much more rain fell in June than in April?



The rainfall in June was ____ centimeters.

The rainfall in April was ____ centimeters.

Subtract to find the difference. $9 - 4 =$ ____

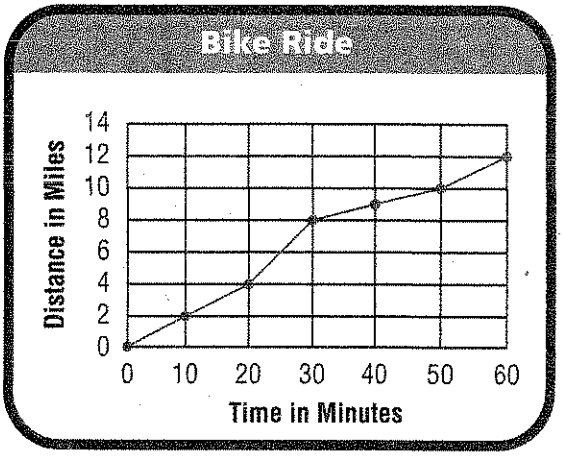
So, in June, ____ more centimeters of rain fell than in April.

Math Talk Explain how you can use patterns to help predict the amount of rain in July.

Share and Show

MATH BOARD

Use the line graph for 1–5. The graph shows the distance Johanna rode on a bike ride.



1. What was the distance Johanna rode in the first 30 minutes?

   _____

2. How many miles did Johanna ride between 30 and 50 minutes?

   _____

3. About how many minutes did it take Johanna to ride the first 6 miles?

   _____

4. What was the distance Johanna rode in 60 minutes?

   _____

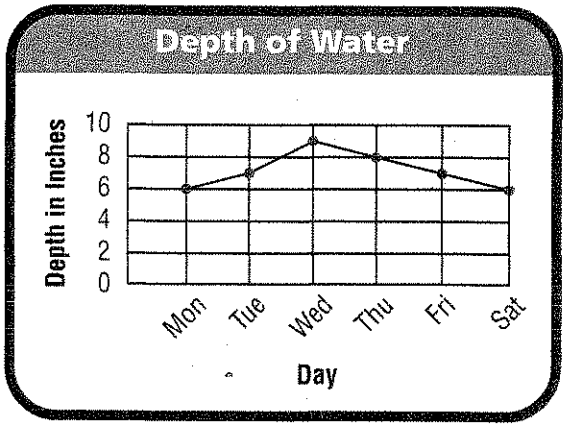
5. How many miles did Johanna ride between 20 and 30 minutes?

   _____

Name _____

On Your Own

Use the line graph for 6–9. The graph shows the depth of the water in a bucket outside over a period of 6 days.



6. How deep was the water on Monday?

   _____

7. How deep was the water on Friday?

   _____

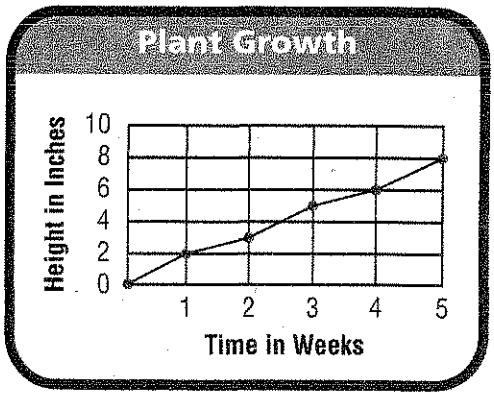
8. Between which days did the depth of the water increase about 3 inches?

   _____

9. When the sun warms water, the water evaporates. Suppose it did not rain and the bucket did not have a leak. How much water evaporated between Thursday and Saturday? Explain.

   _____

Use the line graph for 10–14. The graph shows the growth of a plant over five weeks.



10. How tall was the plant after 2 weeks?

    _____

11. How tall was the plant after 4 weeks?

    _____

12. How many inches did the plant grow between week 1 and week 3? _____

13. How many inches did the plant grow between week 2 and week 5? _____

14. Sam thinks the plant will be 7 inches tall in week 6. Does Sam's statement make sense? Explain.

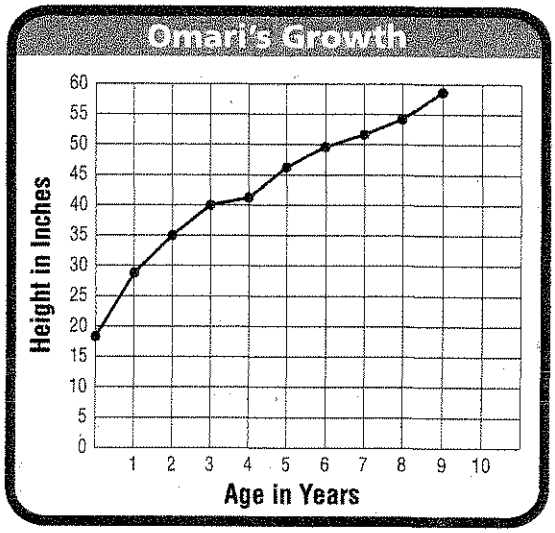
    _____

    _____

Problem Solving REAL WORLD

TEST PREP

Use the line graph for 15–19.



15. How tall was Omari when he was 6 years old?

_____

16. Between which two years did Omari grow 7 inches?

_____

17. H.O.T. About how many years did it take before Omari was twice as tall as he was when he was born? How can you tell?

_____

_____

_____

_____

18. H.O.T. Approximately how tall will Omari be when he is 10 years old? How did you find this?

_____

_____

19. Test Prep About how many inches did Omari grow between the ages of 4 and 7?

Ⓐ about 7 inches

Ⓑ about 10 inches

Ⓒ about 14 inches

Ⓓ about 42 inches

SHOW YOUR WORK

Name _____

Combinations

Essential Question What other way besides a tree diagram can you use to find the number of combinations?

DAP.17.3.3 Use physical models, pictures, and organized lists to find combinations of two sets of objects

UNLOCK the Problem REAL WORLD

Louis has the lunch choices of a sandwich and drink shown below.

Sandwich	Drink
turkey	juice
ham	milk
roast beef	

A **combination** is a result of joining two or more things. How many different combinations of 1 sandwich and 1 drink are possible?

- What are you asked to find?

_____

_____

_____

- What are the 3 sandwich choices?

_____

- What are the 2 drink choices?

_____

One Way Use a tree diagram.

Find the possible combinations.

Sandwich	Drink	Combinations
turkey	juice	turkey sandwich with juice
	milk	turkey sandwich with _____
ham	_____	ham sandwich with _____
	milk	_____ sandwich with milk
roast beef	_____	_____ sandwich with juice
	_____	roast beef sandwich with milk

So, there are _____ possible combinations of 1 sandwich and 1 drink that Louis can choose from.

Math Talk Explain how the number of choices would change if no ham sandwiches were served.

1. How many combinations are there of a turkey sandwich and a drink? _____

Another Way Multiply.

You can multiply to find possible combinations.
There are 3 sandwich choices and 2 drink choices.

Sandwich	Drink
turkey	juice
ham	milk
roast beef	

$3 \times 2 =$ _____

So, there are _____ possible combinations of 1 sandwich and 1 drink.

2. How many combinations of 1 sandwich and 1 drink would be possible if cheese was added to the sandwich choices? _____

3. How can you use multiplication to find the answer? _____

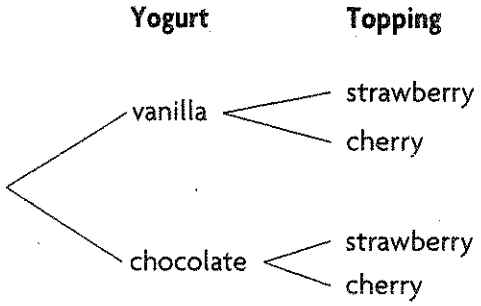
Share and Show MATH BOARD

1. What are the possible combinations of yogurt and 1 topping? Use the tree diagram.

_____

_____

_____



Math Talk Explain how you can use multiplication to find the number of yogurt and topping combinations.

2. Find the number of combinations of a soup and a fruit. Use multiplication.

Soup	Fruit
tomato	banana
chicken noodle	apple
vegetable	

_____ combinations

3. Find the number of combinations of a kind of shoe and a color. Use multiplication.

Shoes	Colors
sneakers	red
sandals	black
boots	white

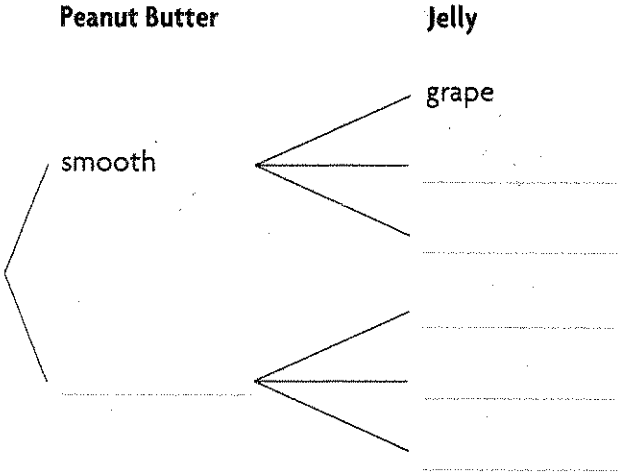
_____ combinations

Name _____

On Your Own

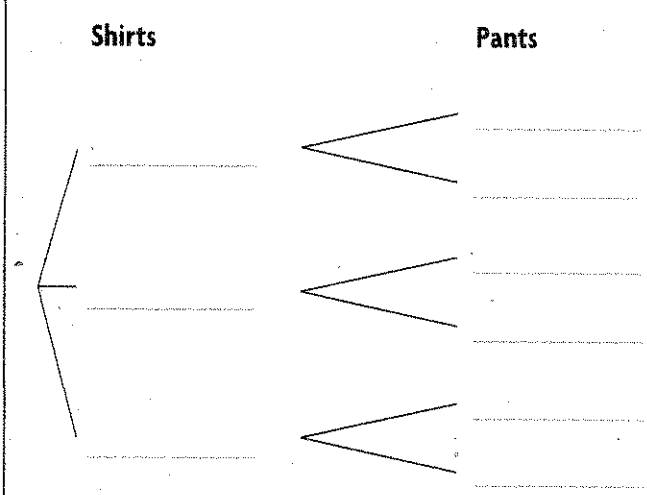
Find the number of combinations. Complete the tree diagram.

4. peanut butter: smooth, crunchy
   jelly: grape, strawberry, raspberry



_____ combinations

5. shirts: yellow, green, striped
   pants: jeans, shorts



_____ combinations

Find the number of combinations. Use multiplication.

6. snacks: pretzels, popcorn, chips
   drinks: water, juice, milk

_____ × _____ = _____

_____ combinations

7. T-shirts: blue, red, white, black
   hats: purple, blue, green

_____ × _____ = _____

_____ combinations

8. crackers: round, square
   spread: butter, cheese, jelly

_____ × _____ = _____

_____ combinations

9. shoes: white, black, brown, red
   socks: red, blue, white, green

_____ × _____ = _____

_____ combinations

10. HOT Write a combination problem that has 12 as the number of combinations. Show how to solve the problem.

_____

_____

_____

Problem Solving REAL WORLD

Use the table for 11–12. Make a tree diagram or use multiplication.

John's Money	
Bills	**Coins**
$1	1¢
$5	5¢
	10¢
	25¢
	50¢

11. John has bills and coins in his pocket. If he reaches in and pulls out 1 coin and 1 bill, how many combinations of 1 coin and 1 bill could he make?

12. H.O.T. Use what you know from problem 11 to find how many combinations John could make if he also had a $10 bill.

SHOW YOUR WORK

13. Write Math **What's the Error?** Oliver has 2 hats and 4 jackets. He says he has 6 combinations of 1 hat and 1 jacket. Is he correct? How could you help Oliver understand the problem?

14. ★ Test Prep Zach's printer has 3 colors of paper and 3 colors of ink. How many combinations of paper color and ink color are possible?

Ⓐ 1 Ⓒ 6

Ⓑ 5 Ⓓ 9

Name _____

Probability: Likelihood of Events

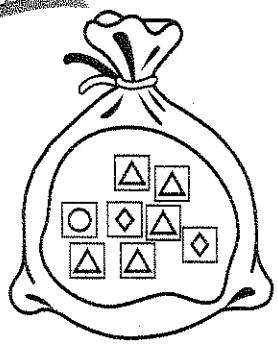
Essential Question What is the probability of an event happening?

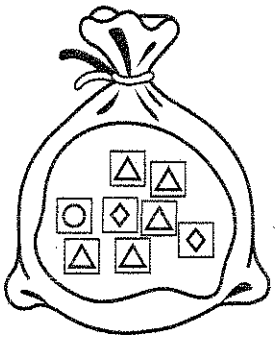
DAP.17.3.2 Conduct simple *probability* experiments, record the data and draw conclusions about the likelihood of possible *outcomes* (roll number *cubes*, pull tiles from a bag, spin a spinner, or determine the fairness of games)

An **event** is something that might happen.
Probability is the chance that an event will happen.

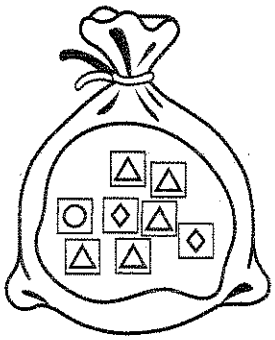
UNLOCK the Problem REAL WORLD

Ted is going to pull a shape card out of this bag without looking. The cards all have the same shape and size. Is it most likely, least likely, certain, or impossible that Ted will pull a triangle card without looking?

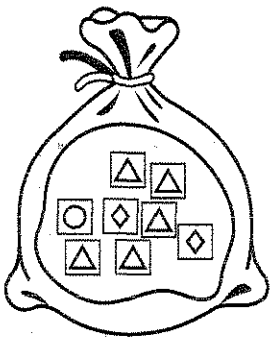




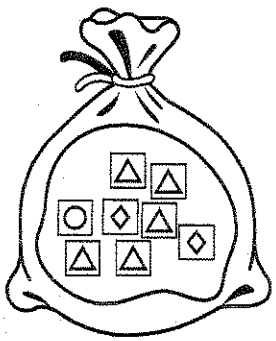
Pulling a triangle card is **most likely**. There are more triangle cards than any other shape.



Pulling a circle card is **least likely**. There are fewer circle cards than any other shape.



Pulling a hexagon card is **impossible**. It will never happen.



In this bag, pulling a shape card is **certain**. It will always happen.

Ted's bag has more _____ cards than circle cards or rhombus cards.

So, it is _____ that Ted will pull a triangle card.

1. Which shape card is Ted least likely to pick: circle, triangle, or rhombus? **Explain**.

_____

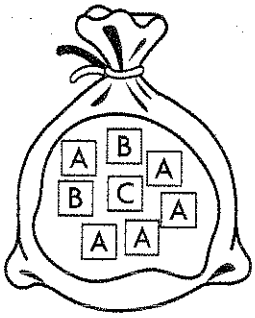
_____

2. Why is it most likely that Ted will pull a triangle card?

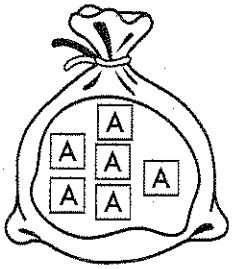
_____

Try This!

The tiles are all the same shape and size. Write *certain*, *most likely*, *least likely*, or *impossible* to describe the probability of pulling an A tile from each bag without looking.

A 

_____

B 

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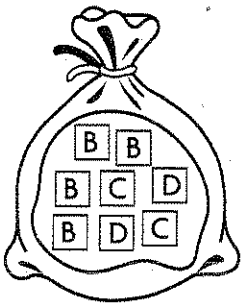
C 

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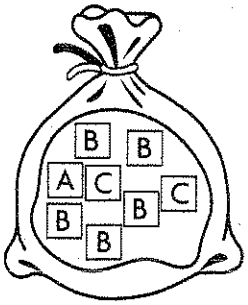
D 

_____

3. Which tile are you least likely to pull from bag A? **Explain.**

_____

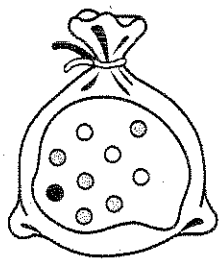
4. How did you decide from which bag an A tile was certain to be pulled?

_____

Share and Show

MATH BOARD

Which color is most likely to be pulled?



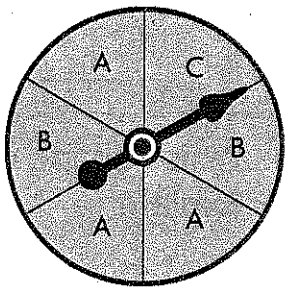
1. The bag contains black, gray, and white counters.

   The most counters are _____.

   The fewest counters are _____.

   So, a _____ counter is most likely to be pulled.

If you spin the pointer one time, tell if each event is *most likely, least likely, certain,* or *impossible*.



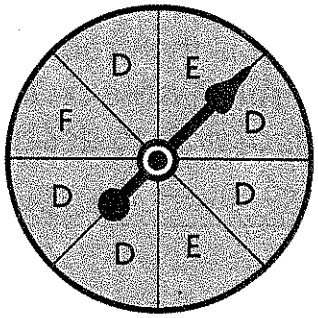
2. The pointer will land on C. _____
3. The pointer will land on A. _____
4. The pointer will land on D. _____
5. The pointer will land on A, B, or C. _____

Math Talk Explain why landing on C on the spinner is least likely.

Name _____

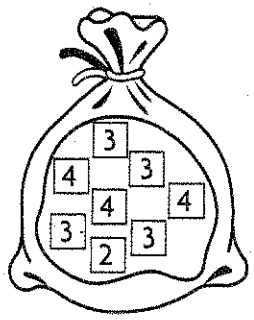
On Your Own

If you spin the pointer one time, tell if each event is *certain, most likely, least likely,* or *impossible*.



6. The pointer will land on D. _____
7. The pointer will land on G. _____
8. The pointer will land on D, E, or F. _____
9. The pointer will land on F. _____

Write *certain, most likely, least likely,* or *impossible* to describe the probability of pulling a 2.

10. 

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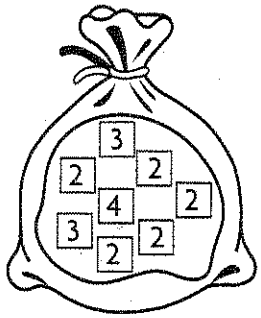
11. 

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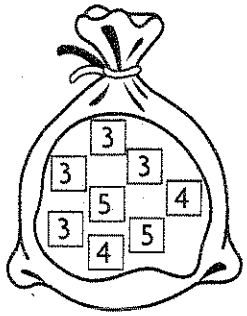
12. 

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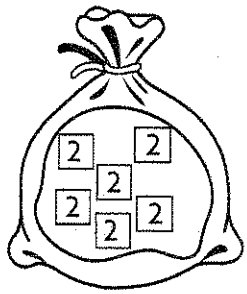
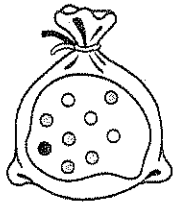
13. 

_____

Write *certain, most likely, least likely,* or *impossible* to describe the probability. Explain.

14. Bobby has these marbles. What is the probability that he will pull a black marble?



_____

_____

15. Jeremy put 6 green tiles, 3 red tiles, and 1 blue tile in a box. What is the probability that he will pull a green tile?

_____

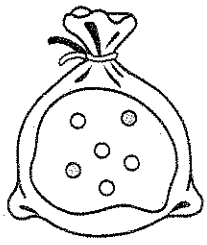
_____

16. Maggie put 15 red tiles in a box. Of the tiles, 3 had the letter A, 2 had the letter B, and 10 had the letter C. What is the probability that Maggie will pull a red tile?

_____

_____

17. Lena has these marbles. What is the probability that she will pull a black marble?

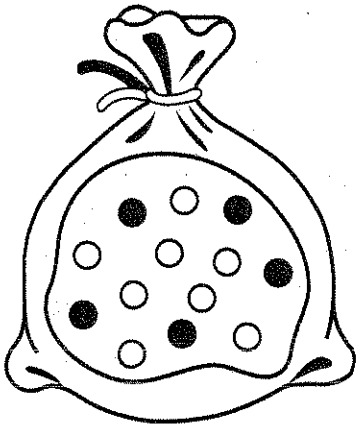


_____

_____

Problem Solving REAL WORLD

Use the diagram for 18–21.



18. What is the probability that Josie will pull a white marble? Write *certain*, *most likely*, *least likely*, or *impossible* to describe the probability. **Explain.**

_____

19. What is the probability that she will pull a gray marble? Write *certain*, *most likely*, *least likely*, or *impossible* to describe the probability. **Explain.**

_____

20. H.O.T. Josie can add any number and color of marbles to her bag. Is there any number and kind of marbles she can add to make the probability of pulling a white marble certain? **Explain.**

_____

_____

21. H.O.T. If Josie could only remove marbles, is there any number and kind of marbles she could remove to make the probability of pulling a black marble certain? **Explain.**

_____

_____

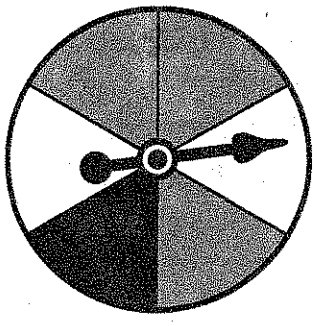
22. ★ Test Prep What is the probability of spinning black?

Ⓐ certain

Ⓑ most likely

Ⓒ least likely

Ⓓ impossible



Name _____

Possible Outcomes

Essential Question How can you determine possible outcomes?

DAP.17.3.2 Conduct simple *probability* experiments, record the data and draw conclusions about the likelihood of possible *outcomes* (roll number *cubes*, pull tiles from a bag, spin a spinner, or determine the fairness of games)

When you toss a coin, there are two possible results. In probability, a possible result is called an **outcome.**

The possible outcomes in a coin toss are *heads* and *tails*. The outcomes *heads* and *tails* are **equally likely** because each has the same chance of happening.

UNLOCK the Problem REAL WORLD

Rick and Sara record the outcomes of tossing a coin 25 times. Before the first toss, they **predict** the results, or tell what they think the results will be. They predict that they will toss heads 12 times and tails 13 times.

Activity Use the results to complete the tally table.

Coin Toss Results	
Outcome	**Tally**

Coin Toss Results

heads, heads, tails, heads, tails, heads, heads, heads, tails, tails, tails, heads, heads, tails, heads, heads, tails, heads, tails, heads, heads, tails, tails, heads, tails

The possible outcome of each coin toss is either _____ or _____.

How many outcomes were there in all? _____

How many outcomes were heads? _____

How many outcomes were tails? _____

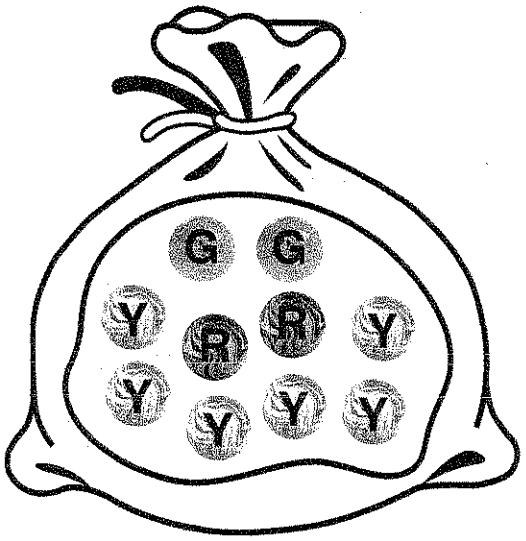
Was Rick and Sara's prediction close to the actual results? **Explain.**

_____

_____

Listing Possible Outcomes

Billy is going to pull 1 marble from the bag below.
What are the possible outcomes for 1 pull?



Key
G = Green
R = Red
Y = Yellow

Math Talk Explain why the probabilities of pulling a green and a red marble from the bag are equally likely.

Think: The possible outcomes do not mean the total number of marbles in the bag but the total number of different kinds of marbles.

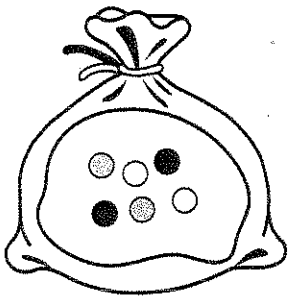
Every color marble in the bag is a possible outcome.

Marbles in the bag: red, green, yellow

So, the possible outcomes for 1 pull are red, green, and yellow.

Share and Show MATH BOARD

1. Elizabeth will pull a counter from the bag. How many possible outcomes are there in all?

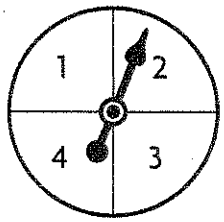


The possible outcomes are: _____

_____.

So, there are _____ possible outcomes in all.

2. David spins the pointer. How many possible outcomes are there in all?



The possible outcomes are: _____

_____.

So, there are _____ possible outcomes in all.

Name _____

On Your Own

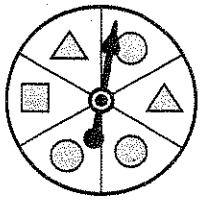
List all the possible outcomes for each.

3. Henry will toss a quarter.

_____

_____

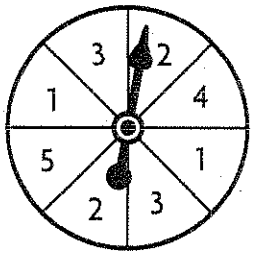
4. Marsha will spin the spinner one time.



_____

_____

5. Terry will spin the spinner one time.



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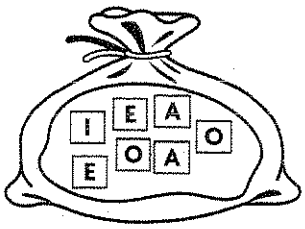
_____

6. Gloria will pull a letter.



_____

_____

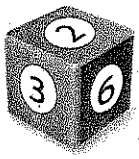
Solve.

7. Maya has a spinner with 1 red, 1 blue, and 1 green section. She will spin the spinner 6 times. How many times do you predict Maya will land on each section? **Explain.**

_____

_____

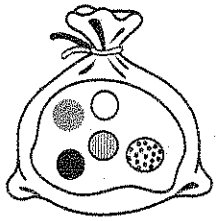
8. What are the possible outcomes for tossing a number cube? Which outcomes are equally likely?



_____

_____

9. Cal will pull 1 counter. How many possible outcomes are there?



_____

10. Billy is going to pull 1 animal card from a hat. He has 2 dog cards, 3 cat cards, 2 goat cards, and 6 cow cards. How many possible outcomes are there for 1 pull? Which outcomes are equally likely?

_____

Problem Solving REAL WORLD

Use the information below for 11–14.

Sheldon brought a bag of fruit freeze pops to share with his friends. The bag has 6 strawberry pops, 4 grape pops, 2 banana pops, and 4 orange pops.

11. How many possible outcomes are there for pulling a fruit freeze pop?

_____

12. List all the possible outcomes for pulling a fruit freeze pop.

_____

13. Which outcomes are equally likely?

_____

14. H.O.T. Two friends selected pops. Of the remaining pops, there are now three flavors that are equally likely to be pulled. What flavors did the two friends select? **Explain.**

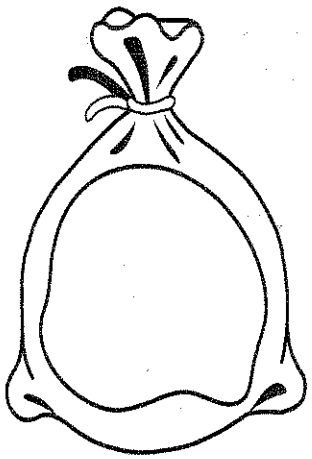
_____

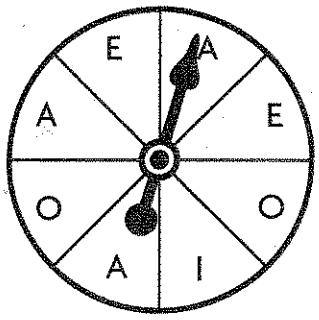
_____

15. H.O.T. Bria has a bag with a combination of 11 marbles in it. There are black, striped, and polka-dotted marbles. She is equally likely to pull a black or polka-dotted marble. She is most likely to pull a striped marble. Draw a combination of marbles Bria might have. Explain why your drawing is correct.

_____

_____





16. ★ **Test Prep** Sarah will spin the spinner one time. How many possible outcomes are there?

Ⓐ 3 Ⓒ 5

Ⓑ 4 Ⓓ 8

Name _____

Probability and Fractions

DAP.17.3.1 Use fractions to predict *probability* of an event

Essential Question How are fractions used to show a probability?

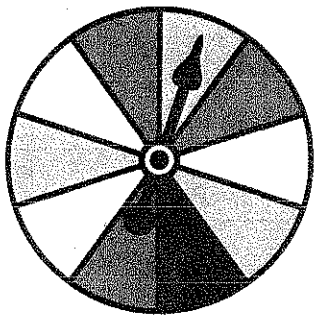
Probability is the likelihood that an event will happen. Probability is often represented as a numeric value between zero and one.

Each possible event is called an **outcome**. Outcomes that have the same probability are considered *equally likely*.

Probability is often written as a fraction. The numerator is the number of possible ways an event can happen. The denominator is the total number of outcomes possible.

UNLOCK the Problem REAL WORLD

Blair is playing a carnival game with a spinner. If he lands on a light or dark gray section, he wins a sticker. If he lands on a white section, he wins a bubble blower. If he lands on the black section, he wins a small stuffed animal.



Example 1 Determine the outcomes.

What is the probability that Blair wins a small stuffed animal?

How many black sections are on the spinner? _____

How many total sections are on the spinner? _____

Probability = $\frac{\text{number of black sections}}{\text{total number of sections}}$ = _____

So, Blair has a _____ chance of winning a small stuffed animal.

Example 2 Count more than one outcome.

What is the probability that Blair wins a sticker?

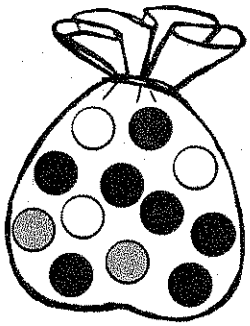
How many light or dark gray sections are on the spinner? _____

Probability = $\frac{\text{number of light or dark gray sections}}{\text{total number of sections}}$ = _____

So, Blair has a _____ chance of winning a sticker.

Math Talk Since every section results in a prize, the probability of winning any prize is represented by the fraction $\frac{10}{10}$, or 1. A probability of 1 means an event will definitely happen.

Probabilities can be described as *certain, likely, unlikely,* or *impossible. Likely* means the event will happen more than $\frac{1}{2}$ the time. *Unlikely* means the event will happen less than $\frac{1}{2}$ the time.



Example 3 Compare probabilities.

Use the bag of marbles. Imagine picking a marble without looking. Guess if each outcome is *certain, likely, unlikely,* or *impossible*. Then write the probability as a fraction.

STEP 1 Identify the number of outcomes for each type of marble.

White: _____

Black: _____

Gray: _____

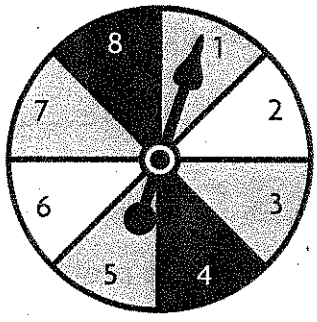
STEP 2 Describe and write the probabilities as a fraction.

Color	Outcome	Probability
White	_____	_____
Black	_____	_____
Gray	_____	_____

Share and Show

MATH BOARD

Use the spinner for 1–6. Write a fraction for the probability of the given outcome.



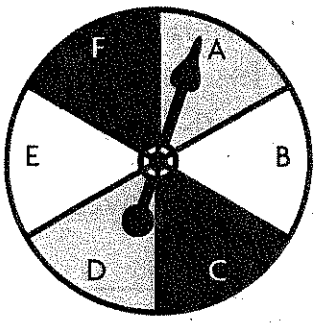
1. black _____
2. an even number _____
3. gray with an odd number _____
4. white with an odd number _____
5. a factor of 12 _____
6. white or gray _____

Math Talk Why does probability have to have a value between one and zero?

Name _____

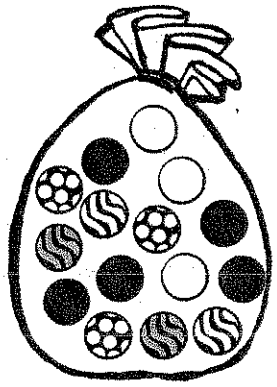
On Your Own

Use the spinner for 7–12. Write a fraction for the probability of the given outcome.



7. white _____
8. a vowel _____
9. gray with a consonant _____
10. black or white _____
11. a letter in the word "carrot" _____
12. white or gray with a vowel _____

Use the bag of marbles for 13–18. Write a fraction to show the probability of each outcome if 1 marble is picked from the bag.



13. solid _____
14. striped _____
15. black _____
16. dotted _____
17. dotted or striped _____

18. H.O.T. What type of marble could you add to make it equally likely to draw a solid or a non-solid marble? **Explain** your answer.

_____

_____

_____

_____

_____

19. There are white, gray, and black marbles in a bag. The probability of drawing a white marble is $\frac{2}{8}$. The probability of drawing a black marble is $\frac{3}{8}$. How many of each marble might be in the bag?

_____

_____

_____

Problem Solving REAL WORLD

Geron is playing a game in which he rolls a number cube to move forward. Each side of the number cube is labeled with a number from 1 to 6. Write a fraction for each event that describes what could happen on his next turn. Then determine if the outcome is *certain, likely, unlikely,* or *impossible.*

20. If he moves forward 3 spaces, he loses a turn.

_____

21. If he moves forward 5 spaces, he gets an extra roll.

_____

22. If he moves forward less than 5 spaces, he will not be in the lead.

_____

23. If he moves forward at least 1 space, he will have a chance to win on his next turn.

_____

24. If he moves forward 7 spaces on this turn, he will win.

_____

25. ★ **Test Prep** A bag holds 3 red tiles, 4 green tiles, and 5 blue tiles. What is the probability of pulling a blue tile?

Ⓐ $\frac{5}{7}$

Ⓑ $\frac{5}{9}$

Ⓒ $\frac{5}{10}$

Ⓓ $\frac{5}{12}$

26. ★ **Test Prep** A spinner is labeled with the numbers 1 through 12. What is the probability of spinning a multiple of 3?

Ⓐ $\frac{1}{12}$

Ⓑ $\frac{2}{12}$

Ⓒ $\frac{3}{12}$

Ⓓ $\frac{4}{12}$